

**Hitchhiker  
Ground Data Systems  
Product Plan,  
Development Effort**

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References to documents and data (hard copy or electronic) in the Product Plan *not* directly under the Team's control shall contain the version identification in the Reference Appendix of the Product Plan.

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## Revision History

Revision	Date
Baseline document	August 1, 2002

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**Customer Agreement  
for the  
Shuttle Small Payloads Project Office  
Hitchhiker Ground Data System Development  
Release Date  
8/2002**

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Barbara Pfarr/Code 584 Branch Head  
Information Systems Division Management Representative

The Team Lead, the Customer/Designee, and the Information Systems Division Management Representative constitute the Configuration Control Board for the Customer Agreement portion (Section 1) of this document.

**Product Development  
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Barbara Pfarr/Code 584 Branch Head  
Information Systems Division Management Representative

The Team Lead and the Information Systems Division Management Representative constitute the Configuration Control Board for this document, with the exclusion of the Customer Agreement (section 1).

## 1.0 Customer Agreement (GPG 1310.1)

This section describes the agreement between the SSPP Office, herein referred to simply as 'the Customer', and the Hitchhiker GDS Development Team including those issues related to requirements, deliverables, and maintenance.

### 1.1 Background

The NASA Goddard Space Flight Center Shuttle Small Payloads Project (SSPP) Office manages the Hitchhiker program. This program is intended for experimenters to fly payloads on the shuttle whose space activity requires power, data, and command services. The Hitchhiker system provides for real-time communications between an experimenter in the Hitchhiker Attached Shuttle Payload Center (ASPC) at Goddard and their experiment on the shuttle.

The Hitchhiker ground system Advanced Carrier Customer Equipment Support System (ACCESS) has relied on the Shuttle Payload Interface Facility (SPIF) Telemetry and Command (TAC) system for low-rate telemetry synchronization and command block generation, the NASCOM Programmable Telemetry Processor (PTP) system for protocol conversion between IP packets and NASCOM RS-422 data for telemetry and command blocks, and an RS-422 signal line matrix switch, all residing in the Hitchhiker Payload Operations Control Center (POCC). In addition, support functions for data recording/playback and command verification/modulation have been provided by the Simulation Operations Center (SOC) and the Data Evaluation Laboratory (DEL) located in building 25. In an effort to consolidate the internal (POCC) systems and external support capabilities, a new system called the ACCESS to Customer Experiments on Shuttle/Station 2 (ACCESS2) System is being developed to incorporate all the above functions.

The mission support Payload Operations Control Center (POCC) configuration for the ACCESS2 System consists of the User Interface Unit (UIU), the NASCOM Interface Unit (NIU), the NASCOM Front-end Processor (NFP), and the Medium Rate Demultiplexer Unit (MRDU). The experiment integration test (I&T) and electromagnetic compatibility (EMC) test configuration consists of the UIU, the Avionics Front-end Processor (AFP), and the MRDU systems. The Simulation Support System (SSS) is used to provide mission simulation support in the POCC.

The UIU is the main console for the system operator. It allows the operator to send ACCESS2 system directives to control the different UIU processes and external components (e.g., the NIU), as well as avionics commands for control of the flight hardware. It also allows the operator to view numerous pages to monitor health and safety and other telemetry status. The UIU ingests PDI, CAS, and CAP IP packets from the NIU or AFP and forwards IP packet command frames to the NIU or AFP (CAS and CAP packets are not received during I&T).

In the POCC, the NFP/NIU systems provide the interface between the NASCOM IP network and the UIU and MRDU. The NIU receives MR, PDI, CAS, and CAP in TCP/IP packet format from the NFP that serves as a gateway to the IPTX network. The NIU performs limited processing, including telemetry synchronization and de-encapsulating NASCOM blocks, before sending the data to the UIU and MRDU. In addition, the NIU receives commands from the UIU and encapsulates NASCOM headers to all commands before forwarding to NASCOM via the NFP. The NIU resides on the Open IONET. The NFP resides on the Closed IONET and initiates connections to the NIU on the Open IONET.



During I&T activities, the AFP system provides the interface between the avionics and the UIU and MRDU.

The MRDU system de-multiplexes individual experimenter data sets from a composite data set down-linked from the Hitchhiker on-board flight processor during Space Shuttle missions. The experimenter data sets will then be forwarded to the appropriate customer. The complete composite data set will be archived to hard disk.

## **1.2 Team Charter**

The Hitchhiker GDS Development Team provides all necessary software and operational support.

The scope of the development team's effort extends to all software development activities necessary to produce a GDS in support of the avionics. Upon completion of the development effort, the ACCESS 2 GDS will be placed under SSPP Office Configuration Management. The scope of this effort will then fall under the maintenance/enhancement plan described in the Maintenance of *Hitchhiker Ground Data Systems Product Plan*.

Procurement and maintenance of all hardware and supplies (toner cartridges, paper, tapes, and CDs) is the responsibility of the Development Team.

## **1.3 Customer Identification**

Shuttle Small Payloads Project (SSPP) Office, Code 870.

## **1.4 Customer Goals and Objectives**

The goal of the Customer is to provide high quality ground support to Hitchhiker experimenters.

## **1.5 Requirements**

Requirements for the Hitchhiker GDS have been established, reviewed, and approved via design reviews, design documents, and meetings with the Customer.

All new requirements to the existing GDS will be through signed Software Development Plans and Requirements Documents. Software Development Plans will address all new requirements, high level architecture, planned builds and reviews, required resources, and any new documentation deliverables.

The following table lists design packages, management plans, and requirements documents that are used in the development effort of the ACCESS 2 GDS.

Controlled Document	Comment	Record Held By
Hitchhiker ACCESS Design Review Package	Review held on 02/08/1993. Attended by project management and peers.	GDS CM Lead
Hitchhiker Old Avionics Thermal System (HOATS) Product Plan	Version 1.1a November 2001	SSPP CM Office
Requirements for Hitchhiker/GAS Bus Communications	Signed/dated by team members and customer.	SSPP CM Office
Requirements for Hitchhiker Carrier to Ground System Communications	Signed/dated by team members and customer.	SSPP CM Office
Y2K Project Management Plan for the SSPPO	Signed/dated by team members and customer.	SSPP CM Office
Requirements for the NASCOM Front-end Processor System and NASCOM Interface Unit System	Signed/dated by team members and customer.	SSPP CM Office
Requirements for the ACCESS 2 System.	Signed/dated by team members and customer	SSPP CM Office

## 1.6 Deliverables

The following items are planned deliverables for the Hitchhiker GDS team:

- Hitchhiker Ground System software development releases and CM packages shall be delivered prior to the start of environmental testing for each mission.
- Hitchhiker Ground System enhancements, procedures, mission procedure documents, and pages, are to be finalized and delivered L-1 month. ASPC configurations shall be completed by L-2 months. Post-mission products shall be delivered within L+30 Days.
- Hitchhiker Ground System customer GSE simulator software shall be delivered L-1 month.
- Hitchhiker Ground System ACCESS 2 User's and Programmer's Guides shall be delivered by L-2 months and shall include the ACCESS 2 redesign.
- Thermal Plotting Program Release 1.2 along with the User's and Programmer's Guides shall be provided by L-2 months.

## 1.7 Schedules

The GDS development Team Lead will track all team efforts and responsibilities on the ACCESS schedule on a regular basis. This schedule will reflect software modification due dates, software releases, documentation updates, system administration efforts, I&T and mission support, and planned reviews (if any).

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A milestone chart will also be maintained to reflect upcoming events, including subsystem integration, acceptance testing, I&T support at GSFC and at KSC, and mission support activities.

## 1.8 Necessary Customer Training

The Hitchhiker GDS Development Team supports all ground system activities. Civil Servants and Contractors (outside the GDS team) supporting the Project and experimenters contracted to fly under the Hitchhiker Program require some training on the components of ACCESS 2. No actual 'customer training' is required.

The appropriate team members will train all GSFC engineers using the GDS. Thermal engineers will be trained to use the HOATS located in the ASPC, Building 14 room S287. Hitchhiker experimenters will receive an overview and training session prior to each mission on ASPC procedures and hardware, including DDUs. Remote experimenters will receive necessary training and documentation to utilize the RAU system.

## 1.9 Medium/Method for Product Delivery (GPG 6400.1)

Hitchhiker GDS Software executables will be installed by the Development Team on the appropriate system supporting an activity. ACCESS 2 executables will be electronically transferred from the server to I&T systems and ASPC systems. All other programs in support of the GDS will be delivered via diskette or electronically, when available.

Software releases will follow the procedures outlined in the *Hitchhiker Ground Data System Configuration Management Plan*.

Quality Record	Comment	Record Held By
Release Notes and Test Summary	Release Tape or CD, Release Notes, and Test Summary	Hitchhiker CM Office

## 1.10 Product Destination

The Hitchhiker GDS for mission support, including all associated hardware and software, will be located in the ASPC, Building 14 room S287. The I&T Systems will reside at GSFC, Building 5 and Building 7/10 for all testing activities and at KSC for field support. Source code will reside on the ACCESS and ACCESS 2000 servers located in Building 5 room W56.

### 1.11 Post Delivery

Maintenance of the Hitchhiker GDS is the responsibility of the GDS Development Team. Post delivery maintenance of the ACCESS 2 GDS will be covered under the product plan for the existing Avionics called, *Maintenance of Hitchhiker Ground Data Systems Product Plan*. At that time, the Maintenance product plan will be updated to include the ACCESS 2 GDS.

In summary, the maintenance will include any modification as a result of a software/hardware problem or a mission-specific enhancement. All modifications to the GDS software or hardware are performed by the GDS Team and will follow the processes described in the *Hitchhiker Ground Data System Configuration Management Plan* and the *SSPPO Configuration Management Plan & Procedures*.

### 1.12 Customer Supplied Elements (technical and resources)

The Customer shall provide all funding necessary to support the Hitchhiker GDS maintenance effort. This includes funding for all personnel, travel expenses, software, and hardware, including third-party maintenance support for some hardware.

The Customer shall provide the overall system requirements for the Hitchhiker GDS, the governing ISO documents, and the Hitchhiker Shuttle Manifest Schedules in preparation for I&T and Mission support.

### 1.13 Customer Involvement

Throughout the development, enhancement, and maintenance of the Hitchhiker GDS, the Customer will continue to serve as a point of contact for questions regarding detailed requirements and operation concepts. The Customer will review and approve all significant changes to the source code resulting in an impact to schedule or cost. The Customer will be invited to participate in regular status meetings. The Hitchhiker GDS Lead will act as the PDL and will make regular contact with the Customer in order to provide status and discuss timely issues. The development team's status meetings will be open to the Customer. The Development Team and the Customer may also meet on an as needed basis for discussion and resolution of certain issues affecting the ground system effort.

### 1.14 Acceptance Criteria

Acceptance testing of new Hitchhiker GDS software will follow the process outlined in the *Software Management Plan for the Shuttle Small Payloads Project*. The GDS will be ready to support a Hitchhiker mission after successful completion of standard I&T activities and Operation Center Simulations. The GDS Development Team will assist with all levels of testing. The Customer will determine which, if any, of the discrepancies noted during testing must be rectified before supporting a mission.

The Hitchhiker GDS Team Lead and the Customer Representative will sign the formal acceptance test plan and summary. Prior to mission support, the Hitchhiker GDS will undergo third party system level acceptance testing and the results will be presented at the Pre-ship Review that takes place prior to shipping a HH payload to KSC for integration into the shuttle.

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Other acceptance criteria are as follows:

- Software Development and Enhancements: Acceptable performance is that each modification achieves expected results, follows documented CM procedures, and is delivered in a timely manner.
- Procedures, Mission Procedure Documents, and Pages: Acceptable performance is that each is accurate and delivered in a timely manner.
- ASPC Configurations: Acceptable performance is that the ASPC is configured for each mission, specific to the needs of the customers, in a timely and accurate manner.
- User's and Programmer's Guides: Acceptable performance is that the guides are updated to reflect any new software development and enhancements. The guides will be maintained on the ACCESS Home Page.
- ISO Product Plans: Acceptable performance is that the plans are kept current and accurately reflect the latest version of the ISD ISO 9001 Product Development Handbook and governing Hitchhiker ISO documents.
- System Administration and IT Security Activities: Acceptable performance is that system and account activities are securely monitored and maintained, and that the operating system patches are kept current on all I&T and mission operations systems.

### **1.15 Customer Agreement Review and Update Process**

The Team Lead, the Customer/Designee, and the Information Systems Division Management Representative constitute the Configuration Control Board (CCB) for the Customer Agreement, this section of the document. Requested changes will be reviewed and must be approved by the CCB before any changes are implemented.

The Hitchhiker GDS Lead will evaluate all requests for changes to requirements and design concepts for time and technical risks.

## 2.0 Design Planning and Interface Management (GPG 8700.1)

Controlled Document	Comment	Record Held By
Development of Hitchhiker Ground Data Systems Product Plan	Signed and dated by the CCB which is listed in the Plan.	Hitchhiker CM Office

Objective Evidence	Comment	Record Held By
ACCESS Task Schedule	Contains work assignments, due dates, and history of completed tasks.	Held and maintained by the CM Lead
Team Organizations	Described within this product plan.	Team Lead
Milestone Charts	Planned activities for upcoming months	Team Lead
Procurement Budget	Inputs submitted to and approved by the Customer on an as needed basis.	Team Lead
Contractor Budget	Inputs submitted to and approved by the Customer on a yearly basis.	Team Lead

### 2.1 General Development Approach

The Shuttle Manifest Schedules dictate the general development approach of the Hitchhiker GDS effort. Team members will be responsible for timely delivery of software modifications, I&T support, and mission operations support as assigned by the GDS Team Lead.

The following COTS products will be utilized:

- SCO Unix, Version 3.0 and Version 5.0.x
- PC-NFS
- Red Hat Linux
- Microsoft Windows 98 and 2000

### 2.2 Resources Needed

Overall support of the Hitchhiker GDS Team is determined by the Customer in the form of a Statement of Work (SOW) request given to the Code 584 Branch Management. Based on the SOW, the GDS Team Lead writes a task assignment to the contractor supporting the Hitchhiker Project. The Code 584 Branch Management also provides civil servant support to the Customer.

An overall budget is determined by the GDS Team Lead and submitted to the Customer's Resource Representative.

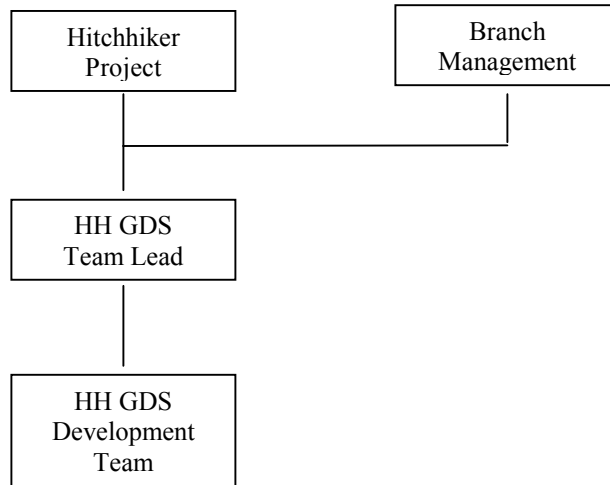
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## 2.3 Team Organization

This section describes the organization and purpose of the Hitchhiker GDS Development Team.

### 2.3.1 Team Organization Chart

The following chart depicts the organization of the Hitchhiker GDS Development Team.



### 2.3.2 Roles, Responsibilities, Authority, Accountability

#### 2.3.2.1 Hitchhiker GDS Lead

The Hitchhiker GDS Lead will act as the Product Design Lead (PDL) and is responsible for the overall development approach and management of the product development effort. The GDS Lead will assign and track work assignments via the PC-based database tool, MS ACCESS. The GDS Lead will also act as one of the GDS developers and the GDS IT Security Lead.

The GDS Lead will provide cost and schedule status to the project on a regular basis via development team status meetings and on an as-needed basis. The GDS Lead is accountable to the Customer for successful performance of the development team's responsibilities. The Customer maintains approval authority for all decisions affecting functionality, operability, and reliability of their experiments.

#### 2.3.2.2 Hitchhiker GDS Developer

The Hitchhiker GDS Developer is responsible for supporting the GDS Lead in the development effort. In addition, the GDS Developer will work as a team to provide all necessary documentation of the product, status reports as required, and support of all Hitchhiker-related operations.

As assigned by the GDS Team Lead, one or more of the GDS developers will act as the GDS CM Lead and the GDS System Administrator.

### **2.3.2.3 Real Time Software Engineering Branch (Code 584)**

The Real Time Software Engineering Branch, as the AETD provider of engineering support for this project will provide organizational support for all aspects of the development effort. This support may include generalized development tools and development environments, documentation support, development computers, related training if available within the branch, augmentation of effort levels as required for development, internal reviews or audits, and software development standards and policies.

### **2.3.3 Decision Making and Conflict Resolution Process**

Decisions related to the Hitchhiker GDS effort will be made collaboratively by the Development Team including the Customer, who has final authority in the event of a conflict.

## **2.4 Team Interfaces**

The GDS Development Team will interface with the experimenters in support of their efforts. Team members will attend all status meetings in an attempt to coordinate software efforts and testing requirements.

The GDS Development Team will interface with the Electrical Leads for Hitchhiker Payloads. Team members will attend any mission specific meetings held by the Electrical Lead. Team members will support any I&T activity led by the Electrical Lead.

## **2.5 Procurement (GPG 5100.1)**

This section describes the purchases planned for the project

### **2.5.1 Procurement Needs and Dates**

No new hardware needs are anticipated as a result of new development. When funding is available (through the Project or Branch) the following items will be procured: upgrades to PCs, new monitors and extra memory to upgrade ACCESS machines.

No new facilities will be required for this effort.



### 2.5.2 Procurement Process

All purchase request needs will be tracked on the ACCESS schedule on an as needed and funding availability basis. Hardcopies of all purchase requests initiated by the Team Lead will be maintained in a notebook (kept by the Team Lead).

Purchases of hardware and/or software will be accomplished using the Small Purchases System (SPS) or a Government Credit Card issued to the Team Lead. All purchases will be compliant with Federal Acquisition Regulations.

All contractor support will be obtained through the following venue:

Contract Number: NAS5-01090 (MSES contract)

Contractor Name: the Hammers Company

Quality Record	Comment	Record Held By
SPS Purchase Request Printout	Printout from SPS system kept in logbook. If purchase requires a WOA, WOA number hand written on SPS printout.	Team Lead

### 2.6 Team Training Plan (GPG 3410.2)

Training for the GDS Civil Servant Team Members may include relevant center-funded courses offered by GSFC or third party vendors. The GDS Lead on a periodic basis will assess training requirements for each team members. All training required of the civil servant team members will also be required of the contractor team members. The contractor will be reimbursed through the task for the appropriate costs.

Quality Record	Comment	Record Held By
Records of required training needed	Anticipated training is listed on employees' performance plans.	Branch Level
Records of required training completed		Branch Level

### 2.7 Risk Mitigation

The Hitchhiker GDS effort is at low risk for time, resource, and technical issues. To mitigate risks, all software modifications require thorough acceptance and regression testing as per the *Hitchhiker Ground Data System Configuration Management Plan* and via Hitchhiker CCB approval as per the *SSPPO Configuration Management Plan & Procedures*.

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## **2.8 Security**

The GDS Team Lead has developed a document that addresses the basic issues of the GDS security effort. Overall, each system has password security protection and is located within locked facilities during non-business hours. Center security messages are read on a daily basis and implemented where needed.

## **2.9 Detailed Schedule**

As described in section 1.7 (Schedules) of this document, the GDS Team Lead will track all team efforts and responsibilities on the ACCESS schedule on a regular basis. This schedule will reflect software modification due dates, software releases, documentation updates, system administration efforts, I&T and mission support, and planned reviews (if any).

A milestone chart will also be maintained to reflect upcoming events, including subsystem integration, acceptance testing, I&T support at GSFC and at KSC, and mission support activities.

## **2.10 Technology and Commercialization Plan**

There will be no technology and commercialization plan for this product

### 3.0 Technical Approach

This section describes the technical approach that will be used in the development of the GDS.

#### 3.1 Design Development (GPG 8700.2)

##### 3.1.1 Product Requirements

All product-related requirement documents are listed in Customer Requirements Section 1.5 of this document.

The following table lists interface control documents and protocols followed by the Hitchhiker GDS team:

Controlled Document	Comment	Record Held By
Hitchhiker ACCESS Network Communication Protocol	Pre-ISO document. Available on ACCESS homepage.	GDS CM Lead
Interface Control Document (ICD) Between Attached Shuttle Payload Center (ASPC) and Hitchhiker Remote POCC	Pre-ISO document. Available on ACCESS homepage.	GDS CM Lead
Hitchhiker Remote POCC Development Plan	Pre-ISO document. Available on ACCESS homepage.	GDS CM Lead

##### 3.1.2 Product Design

Quality Record	Comment	Record Held By
Hitchhiker ACCESS Design Review Package	Review held on 02/08/1993. Attended by project management and peers.	GDS CM Lead
Hitchhiker Old Avionics Thermal System (HOATS) Software Product Plan	November 2001	SSPP CM Office

##### 3.1.3 Development Methodology (GPG 8072.1)

This section describes the methodology that will be employed in the development of this product.

The general approach to the software development of the Hitchhiker GDS is to maximize the reuse of the existing Avionics GDS software. New capabilities are designed, developed, tested, and released in incremental builds. Builds are determined by customer needs and mission-specific requirements.

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The following documents are provided by the Customer and will be used as guidelines for the development effort: *SSPPO Product Development Management Plan* and the *Software Management Plan for the Shuttle Small Payloads Project*.

The methodology used for the maintenance and enhancement of the Hitchhiker GDS will follow the Structured Design Approach outlined in the *Software Management Plan for the Shuttle Small Payloads Project*. Typically, the use of classic top-down structured design will be the primary software engineering life cycle model to be used for the SSPPO.

#### **3.1.3.1 Buy Approach (GPG 5100.1)**

No special purchasing strategies are required to obtain any hardware or software procurement.

#### **3.1.3.2 Build Approach**

The system will be built and released as needed throughout the software lifecycle. The build approach will be iterative; where all software units are present in some form with new capabilities added in subsequent builds.

#### **3.1.3.3 Prototyping Approach**

No special prototyping approach is used to develop the Hitchhiker GDS. As stated earlier in this section, the general approach to the software development of the Hitchhiker GDS is to maximize the reuse of the existing Avionics GDS software.

#### **3.1.3.4 Customer Supplied Products Approach**

No customer-supplied elements are anticipated.

### **3.1.4 Product Testing**

#### **3.1.4.1 Product Inspection and Test (GPG 5330.1)**

Inspection and test will be performed in accordance with the *Hitchhiker Ground Data System Configuration Management Plan*.

The Hitchhiker GDS Lead will be the inspection authority for all test verification and validation plans. The HH GDS Lead will also approve changes to these plans.

Controlled Document	Comment	Record Held By
Hitchhiker Ground Data System Configuration Management Plan.	Defines the overall CM approach adopted by the HH GDS team.	Hitchhiker CM Office

Quality Record	Comment	Record Held By
CM package for each task item.	Includes: <ul style="list-style-type: none"> <li>• Unit Test Plans</li> <li>• Integration Test Plans</li> </ul>	GDS CM Lead
ACCESS 2 xx.1 CM Release Notes and Test Summary	Release Tape, Release Notes, and Test Summary	Hitchhiker CM Office
ACCESS 2 Release Letter V.xx.1	Lists the release number, included capabilities of the release, and a summary of an outstanding minor or major nonconformance.	Customer - original GDS CM Lead - copy

### Acceptance Criteria and Objectives

Acceptance criteria and objectives will be established in accordance with the *Software Management Plan for the Shuttle Small Payloads Project*. Acceptance testing for each build will be performed according to an Acceptance Test Plan. The plan includes a matrix of requirements and test objectives, test operational scenarios, and required test equipment (hardware/software). Results of the acceptance test will be published in an Acceptance Test Report. Based on this report, the Customer will determine if a build will be accepted or rejected for re-work. Acceptance Test Plans and Acceptance Test Reports will be reviewed and approved by the HH GDS Lead.

Quality Record	Comment	Record Held By
ACCESS2 System Acceptance Test Plan V.xx.1	The purpose of this test plan is to verify the elements of each task id incorporated into the ACCESS2 System V.xx.1	GDS CM Lead

### 3.1.4.2 Incoming Inspection and Test (GPG 4520.2)

No inspection other than kind, count, and condition of purchased products is planned.

The Receiving Inspection and Test System (RITS) will be used for all ground hardware associated with mission operations use. The RITS WOA number and paperwork will be kept with the purchase order hardcopy (SPS Purchase Request Notebook kept by Team Lead).

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Quality Record	Comment	Record Held By
RITS Work Order Authorization (WOA)	RITS entry made by Team Lead or Team purchase person	Team Lead
Incoming Inspection Nonconformance Report	See GPG 5340.2	Center Nonconformance Reporting /Corrective Action (NCR/CA) System

### 3.1.4.3 Statistical Techniques (GPG 8070.2)

The team has evaluated the need for statistical testing of the products developed under this Product Plan and has determined that statistical techniques are not required.

## 3.1.5 Development Status

### 3.1.5.1 Design Implementation Status

Objective Evidence	Comment	Record Held By
ACCESS task schedule	<ul style="list-style-type: none"> <li>Includes status of each task element.</li> </ul>	Maintained by the CM Lead

### 3.1.5.2 Testing Status

Objective Evidence	Comment	Record Held By
ACCESS task schedule	<ul style="list-style-type: none"> <li>Includes status of each task's testing effort.</li> </ul>	Maintained by the CM Lead
CM package for each task item.	Includes: <ul style="list-style-type: none"> <li>Unit Test Plans</li> <li>Integration Test Plans</li> </ul>	GDS CM Lead

### 3.1.6 Development Environment

The Hitchhiker GDS software modifications will be made on development systems located at GSFC in building 5.

Operational support using the GDS will vary depending on the activity. I&T activities within lab areas and clean rooms will be performed at GSFC in buildings 5 and 7/10. KSC I&T activities take place as the experiment is installed within the orbiter, location is TBD. All mission operation activities are located at GSFC in the ASPC building 14, room S287.

All modifications to the Hitchhiker GDS software will be performed on personal computers. The platforms vary depending on the component. The following platforms will be utilized:

- SCO Unix
- Visual Basic and Borland C++ Builder under Windows 95, 98, 2000
- Microsoft C under DOS
- Red Hat Linux

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### 3.1.7 Technical Review Program (GPG 8700.4)

All new development efforts, as part of the Hitchhiker GDS, will comply with the types of reviews described in the *Software Management Plan for the Shuttle Small Payloads Project*.

Specifically, the Hitchhiker GDS will conduct, at a minimum, a team design review for new subsystem development consisting of medium-size system changes. A peer review (covering requirements and design) will be conducted for new components of ACCESS 2 or large subsystem development efforts, including redesigns of the existing GDS. Both the team review and the peer review will include the Customer.

Quality Record	Comment	Record Held By
Review Meeting Notes with Action Item List and Resolutions	Peer Reviews only	GDS CM Lead
Attendance Sheet with subject, date, and signatures of attendees	Peer Reviews only	GDS CM Lead

### 3.2 Process for Handling, Storage, Packing, Marking, Preservation, and Transportation (GPG 6400.1)

No formal transportation of the product will be done. The product will be delivered as described in section 1.9 (Medium/Method for Product Delivery) of this plan.

### 3.3 Servicing – Process for Product Maintenance

Software maintenance will be the responsibility of the GDS Development Team. Servicing of all hardware will be evaluated on a per incident basis. Parts will be interchangeable or replaced at the expense of the Customer.

Quality Record	Comment	Record Held By
CM package for each task item.	Includes: <ul style="list-style-type: none"> <li>• Unit Test Plans</li> <li>• Integration Test Plans</li> </ul>	GDS CM Lead
ACCESS 2 xx.1 CM Release Notes and Test Summary	Release Tape, Release Notes, and Test Summary	Hitchhiker CM Office
ACCESS 2 Release Letter V.xx.1	Lists the release number, included capabilities of the release, and a summary of an outstanding minor or major nonconformance.	Customer - original GDS CM Lead - copy

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## 4.0 Product Assurance

This section describes the processes and procedures that will be followed in order to assure that the product continues to satisfy the Customer's requirements.

### 4.1 Product Quality Assurance

This section describes the processes and procedures that will be followed in order to assure that the Customer receives a quality product.

#### 4.1.1 Control of Non-Conforming Products and Corrective Action (GPG 5340.2/GPG 1710.1)

Control of non-conforming products will be in accordance with the *SSPPO Quality Management Plan*. Minor non-conformances are written on a 'Hitchhiker Ground Data System Minor Non-Conformance Report.' The HH GDS Lead will track the status of all reported (minor or major) non-conformances on the ACCESS schedule.

Corrective and preventive action will be in accordance with the *SSPPO Quality Management Plan*. During the Product Nonconformance Process, the Hitchhiker GDS Team will determine the cause of the problem (including any process related causes), document any recommended changes, and submit them to the Configuration Management process for appropriate action.

Quality Record	Comment	Record Held By
Hitchhiker Ground Data System Minor Non-Conformance Reports	Retained in logbook.	Team Lead
Nonconformance records from Center NCR system		Center NCR system
Corrective Action Plan for NCRs	In the NCR system	Team Lead
Product Release Letter for the ACCESS2 System V.xx.1	Lists the release number, included capabilities of the release, and a summary of an outstanding minor or major nonconformance.	Customer - original GDS CM Lead - copy

### 4.2 Configuration Management (GPG 1410.2)

Configuration management will be performed in accordance with the *Hitchhiker Ground Data System Configuration Management Plan* and the *SSPPO Configuration Management Plan and Procedures*.

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#### 4.2.1 Control of Team Software, Hardware, Documentation, and Data

Identification and 'traceability' of a software release will be performed in accordance with the Configuration Change Request (CCR) process described in the *Hitchhiker Ground Data System Configuration Management Plan* and the *SSPPO Configuration Management Plan & Procedures*.

The Hitchhiker GDS Lead will control all documents and software programs/executables as per the *Hitchhiker Ground Data System Configuration Management Plan* and the *SSPPO Configuration Management Plan & Procedure*.

In an effort to safeguard the GDS software products between build releases, the following procedure will be followed to backup and store software on a daily/weekly basis.

- Store one week worth of daily backup tapes in team member's cabinet in Bldg. 5 room W50 (not at the ACCESS fileserver). Each backup tape will be labeled with a day-of-week. On a daily basis, Monday through Friday replace the previous night's tape with the appropriately labeled tape (i.e. put backup tape marked 'Tuesday' into tape device on Tuesday morning).
- Every Monday, take the previous week of tapes (5) from team member's cabinet for storage in the Bldg. 14 ASPC ACCESS cabinet. Take the previously stored tapes from the ASPC back to Building 5 for reuse during that week.

Quality Record	Comment	Record Held By
The ACCESS2 System V.xx.1 CM Release Notes and Test Summary	Software releases will be made periodically to maintain the GDS system.	Hitchhiker CM Office
List of items under configuration management	A combination of the QRL and the GSFC Centralized CM System.	GDS CM Lead
Copy of signature page of configuration management items.	Original signature pages are stored with the CM lead.	GDS CM Lead
HH GDS CCB Records	The CM Lead retains a copy of an original CCR. Signed off CCR is retained in the HH CM Office.	Hitchhiker CM Office

#### 4.2.2 Control of Test Software and Hardware (GPG 8730.1)

Control of the test equipment provided by the Customer is the responsibility of the Customer. Control of significant test software products under the cognizance of the development team will be achieved through processes defined in the *Software Management Plan for the Shuttle Small Payloads Project*.

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Controlled Document	Comment	Record Held By
Documentation of Test Software Verification Activities	Includes Test Plans	GDS CM Lead

Quality Record	Comment	Record Held By
Test software test results		GDS CM Lead

#### 4.2.3 Quality Records (GPG 1440.7)

Control of quality records will be in accordance with the *SSPPO Quality Management Plan*. The Hitchhiker GDS Lead is the quality record coordinator and will maintain a copy of the Quality Record List.

As quality records are generated, they will be placed under GDS CM control and added to the GDS Quality Record List (QRL). The QRL will then be signed and placed with other quality records in a file cabinet maintained by the GDS CM Lead in Building 5 Room W050.

Controlled Document	Comment	Record Held By
Quality Records List		GDS CM Lead

#### 4.2.4 Control of Customer Supplied Elements (GPG 5900.1)

No customer-supplied elements are anticipated.

### 4.3 Process and Product Metric Analysis

The process of the Hitchhiker GDS development effort will be analyzed through status meetings with the Customer.

A metrics matrix based on Appendix F of the *Code 580 Product Development Handbook* will be maintained throughout the product life cycle. This matrix identifies and tracks key metrics associated with the Hitchhiker GDS development effort and will be updated and reviewed periodically to monitor the progress towards meeting planned milestones. This matrix is part of the quality records maintained for the GDS product.

Quality Record	Comment	Record Held By
Required Metrics	Contains the Project, Schedule, Cost, and Quality Metrics.	Team Lead

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## 5.0 Product Development Journals

### 5.1 Team Lessons Learned

Official 'lessons learned' are not kept. As deficiencies are found, every effort to enhance the software or documentation will be made to alleviate the problem for the future. Anomalies will be documented in the ACCESS Task Schedule; and proposed workarounds will be discussed and assigned at the weekly ACCESS Status meetings.

During each Hitchhiker mission, a mission logbook is kept. The logbook documents all activities and anomalies, including time and a detailed response to each issue. These logbooks are reviewed post mission and corrective action is implemented to prevent similar anomalies in the future. These logbooks are stored within the ASPC for quick reference during subsequent missions.

Objective Evidence	Comment	Record Held By
STS-xxx Mission Logbook	Mission specific issues are documented. Documents are stored at the ASPC.	Team Lead (indirectly)

### 5.2 Key Issues, Decisions, and Rationale

A log of key issues, decisions, and rationale will be maintained throughout the life cycle of the Hitchhiker GDS Team.

Objective Evidence	Comment	Record Held By
Log of Key Issues, Decisions, Rationale	New requirement in place as of the signing of this document.	Team Lead

## Appendix A: Acronym List

ACCESS	Access to Customer Experiments on Shuttle/Station
AETD	Applied Engineering and Technical Directorate
AFP	Avionics Front-end Processor
ASPC	Attached Shuttle Payload Center
CAP	Command Acceptance Pattern
CCB	Configuration Control Board
COTS	Commercial off-the-shelf
CM	Configuration Management
DDU	Data Display Unit
EDDU	Engineering Data Display Unit
GAS	Get Away Special
GDS	Ground Data System
GSFC	Goddard Space Flight Center
HH	Hitchhiker
IMTE Team	Inspection Measuring Test Equipment Team
ISD	Information Systems Division
ISO	International Organization of Standardization
ITOS	Integrated Test and Operations System
I&T	Integration and Test
KSC	Kennedy Space Center
MRDU	Medium Rate Data Unit
MRPOST	Medium Rate Post Program
NASA	National Aeronautics and Space Administration
NCR	Non-Conformance Record
NFP	NASCOM Front End Processor
NIU	NASCOM Interface Unit
PDI	Payload Data Interleaver
PDL	Product Design Lead
POCC	Payload Operations Control Center
PTP	Programmable Telemetry Processor
RAU	Remote Access Unit
RFA	Requests for Action
RITS	Receiving Inspection and Test System
SPIF	Shuttle Payload Interface Facility
SPS	Small Purchases Systems
SSPP	Shuttle Small Payloads Projects
SSPPO	Shuttle Small Payloads Projects Office
SSS	Simulation Support System
STAMP	Stand Alone Mission Processing Program
S/W	software
TAC	Telemetry and Command
TBD	to be determined
TDU	Thermal Display Unit
UIU	User Interface Unit
WOA	Work Order Authorization

## **Appendix B: References**

1.Hitchhiker Ground Data Systems Product Plan, Development Effort

870-REF-0343 (Baseline, 08/01/2002)

[http://gdms.gsfc.nasa.gov/gsfc\\_cm/plsql/frontdoor](http://gdms.gsfc.nasa.gov/gsfc_cm/plsql/frontdoor)

2.Hitchhiker Ground Data System Product Plan, Maintenance Effort

870-REF-0201 (Revision D, 08/01/2002)

[http://gdms.gsfc.nasa.gov/gsfc\\_cm/plsql/frontdoor](http://gdms.gsfc.nasa.gov/gsfc_cm/plsql/frontdoor)

3.Hitchhiker Ground Data System Configuration Management Plan

870-REF-0215 (Baseline, 02/02/2000)

[http://gdms.gsfc.nasa.gov/gsfc\\_cm/plsql/frontdoor](http://gdms.gsfc.nasa.gov/gsfc_cm/plsql/frontdoor)

4.Requirements for Hitchhiker/GAS Bus Communications

870-SPEC-0068 (Revision N, 04/16/1999)

[http://gdms.gsfc.nasa.gov/gsfc\\_cm/plsql/frontdoor](http://gdms.gsfc.nasa.gov/gsfc_cm/plsql/frontdoor)

5.Requirements for Hitchhiker Carrier to Ground System Communications

870-SPEC-0069 (Revision H, 04/16/1999)

[http://gdms.gsfc.nasa.gov/gsfc\\_cm/plsql/frontdoor](http://gdms.gsfc.nasa.gov/gsfc_cm/plsql/frontdoor)

6.ISC Product Development Handbook

580-PG-8730.3.1 (Revision F, 6/15/2002)

<http://isc.gsfc.nasa.gov/Iso9k/pdh/PDH.pdf>

7.SSPPO Configuration Management Plan and Procedures

870-PG-1410.2.1 (Revision C, 12/18/2000)

<http://gdms.gsfc.nasa.gov/gdms/plsql/masterlist.pgwi>

8. Software Management Plan for the Shuttle Small Payloads Project

870-PG-8700.1.2 (Revision E, 09/22/2000)

<http://gdms.gsfc.nasa.gov/gdms/plsql/masterlist.pgwi>

9. SSPPO Product Development Management Plan

870-PG-8700.1.1 (Revision C, 09/22/2000)

<http://gdms.gsfc.nasa.gov/gdms/plsql/masterlist.pgwi>

10. SSPPO Quality Management Plan

870-PG-7120.2.1 (Revision F, 04/12/2000)

<http://gdms.gsfc.nasa.gov/gdms/plsql/masterlist.pgwi>